

Unit

2



Livestock Accommodation

INTRODUCTION

Proper housing based on scientific principles is an important aspect of dairy animal management for obtaining maximum productivity of the animals. A clean and comfortable shelter increases the comfort level of the animals and results in their good health. The essential criteria for housing dairy animals includes animal health and comfort, hygiene, protection from predators, theft and diseases, efficient and economical use of labour and provision of suitable environment for hygienic milk production. In the absence of proper housing, animals are exposed to extreme temperature, wind, cold, rain, snowfall, etc., which adversely affect their health, production and reproduction. This Unit discusses the various aspects of dairy animal housing along with disposal of manure to maintain healthy environment in the dairy farm.

SESSION 1: BASICS OF ANIMAL HOUSING

The efficient management of dairy animal is incomplete without a well-planned housing (Fig. 2.1).

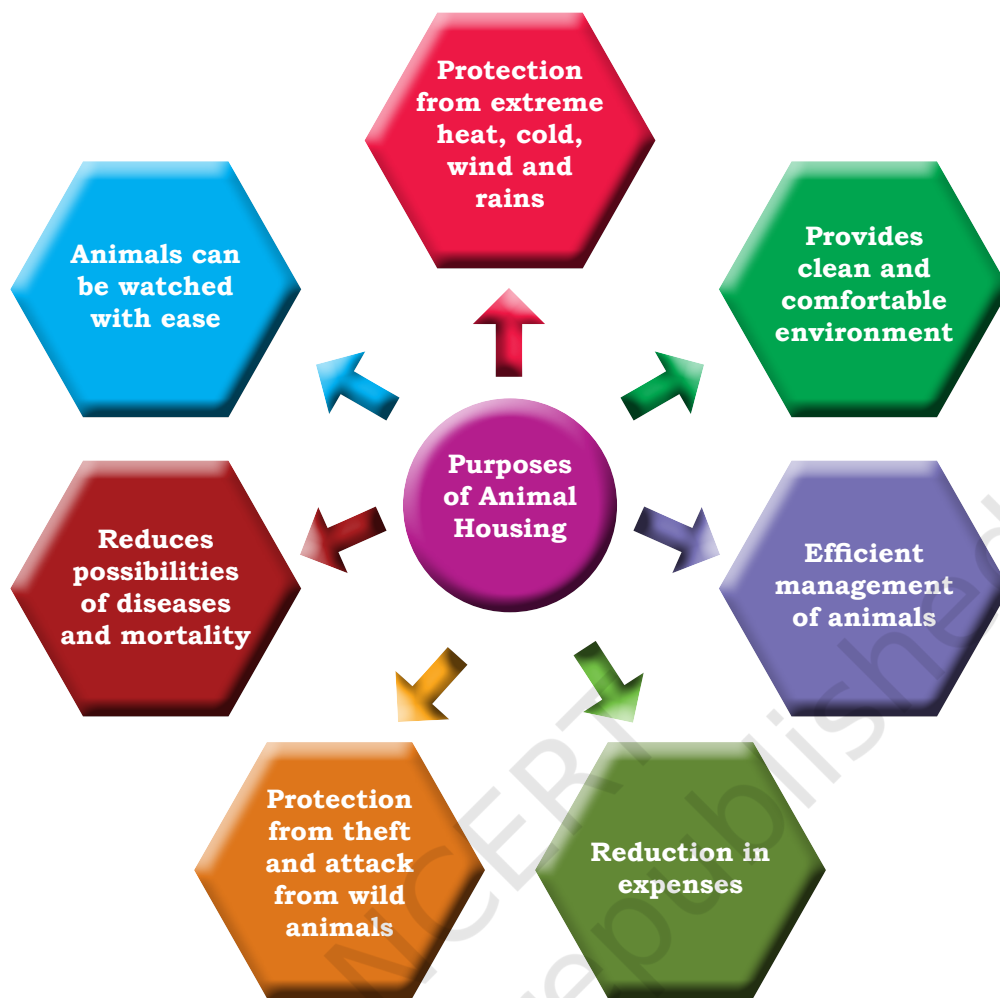


Fig. 2.1: Purposes of animal housing

Key aspects of animal housing

Six important aspects of livestock housing are as follows.

1. *Space*: Availability of sufficiently spacious area allows the animals to move freely and gives them easy access to feed and water.
2. *Feed*: Arrangements are made in housing so that animals can eat a palatable and well-formulated feed. The feed is available daily for at least 21 hours.
3. *Water*: Accessibility of clean water for at least 21 hours daily.
4. *Air*: Access to fresh and clean air.



5. *Light*: Availability of sufficient natural light and provision to maintain six hours of darkness for farm animals are essential for optimum production.
6. *Rest*: Sufficient dry and comfortable space for taking rest and lying down for at least 13 hours per day.

Types of livestock housing

The classification of various types of housing system are given in Fig. 2.2.

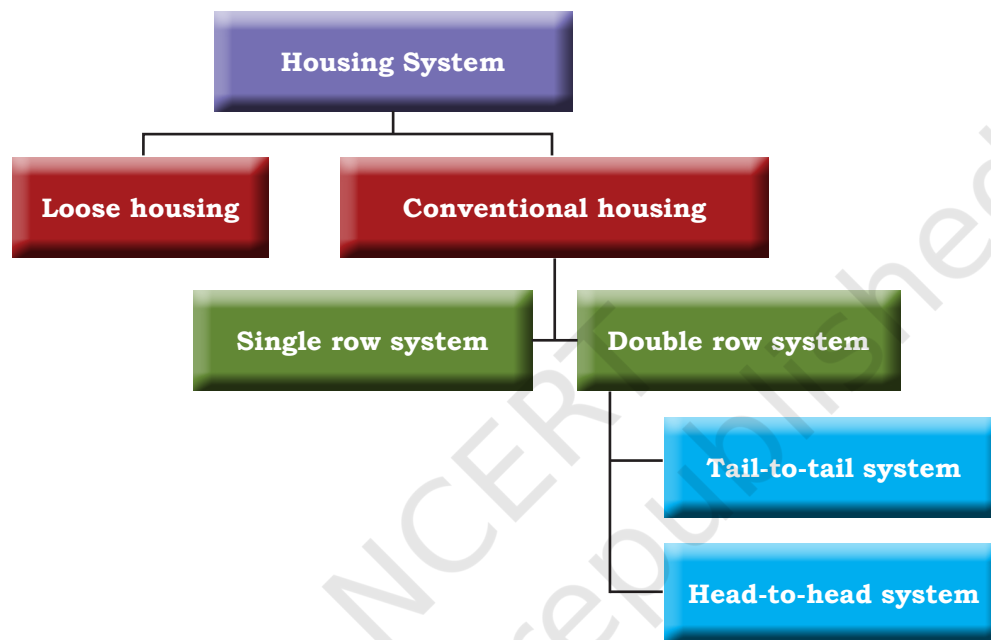


Fig. 2.2: Types of livestock housing

Loose housing system

In this system of housing, animals are kept loose in an open area in groups, during the day and night, except for specific purposes like milking, treatment and breeding. A loose housing layout has an open area and a resting area.

The open area has a covered shed on one side (Fig. 2.3) under which the animals can retire during



Fig. 2.3: Cattle kept under loose house system



Fig. 2.4: Buffaloes kept in a loose house system with common manger



Fig. 2.5: A view of loose housing for livestock

excessive heat, cold, rains, etc. In this system of housing, feed and fodder is offered in a common manger (Fig. 2.4) and water is provided in common water troughs. The total area is protected by a compound wall or fencing of minimum 5 feet height (Fig. 2.5). There is a separate milking parlour with facilities for milking of animals.

This system is ideal for areas of low rainfall such as the states of Punjab, Haryana, Rajasthan, western Uttar Pradesh and parts of Gujarat, Madhya Pradesh and Maharashtra. In other areas, this system can be used after making minor modifications as per the requirement.

Flooring in loose housing system

The floor of the dairy animal shed is made of waterproof material which can be easily cleaned and dried so that it is not slippery. Paving with bricks or grooved cement concrete floor can be used for this purpose.

Insufficient space results in overcrowding of animals, which can lead to abnormal behaviour, decreased body weight gain and drop in their overall performance. Table 2.1 shows the floor space requirement for various categories of animals under loose housing system.



Table 2.1: Suggested floor space requirement for loose housing as per Bureau of Indian Standards (BIS)

Type of animals	Floor space required (m ²)		Maximum no. of animals in each group	Height of shed at eaves
	Covered area	Open area/paddock		
Cow	3.5	7.0	40	175 cm in medium and heavy rainfall areas and 220 cm in semi-arid and arid areas.
Buffalo (female)	4.0	8.0	40	
Bull	12.0	24.0	1	
Down calver	12.0	12.0	1	
Young animal (beyond one year)	2.0	4.0	30	
Calf (below one year)	1.0	2.0	30	

Mangers and water troughs

For optimum output from animals, adequate space is required so that animals have free access to feed and water round the clock. The water troughs are located near the feeding area and seldom in the resting area. Mangers and water troughs are constructed with reinforced cement concrete, or brick with cement mortar or stone slabs with cement joining. The mangers need to have smooth surfaces for easy cleaning and easy intake of feed by the animals. Feeding and watering space requirements are given in Table 2.2. Water depth is kept at a minimum of 3 inches to enable the animal to submerge its muzzle 1 to 2 inches deep in the water trough. Separate watering point is provided for every 15 to 20 cows. In very young calves, water is never given when milk or milk replacer is fed, to avoid interference with digestion of milk (curd formation).

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Table 2.2: Suggested feeding and watering space requirements

Types of Animal	Linear length per animal (metres)	Total manger length (metres) per 100 animals	Water troughs (metres) per 100 animals	Dimensions of manger/water trough		
				Height of wall (cm)	Depth (cm)	Width (cm)
Adult cows and buffaloes	0.6–0.7	60–75	6.0–7.5	60	40	50
Calves	0.4–0.5	40–60	4.0–5.0	40	15	20



Fig. 2.6: Bedding in the resting area

Resting area

The resting area is a building or enclosure where cattle can rest or lie down on a dry bed. It provides shelter from cold winds, snow, rain and extremes of weather, and is always roofed. Resting area is not used as a waiting or exit area for the milking parlour. Feeding and watering is never provided in the resting area.

Bedding material for resting area

Bedding is provided to the animals to keep them clean and comfortable. It absorbs liquid manure. The usual bedding material are wheat straw, rice straw and sawdust. The desirable qualities of the bedding material are bulkiness and large liquid absorption capacity. On an average, 2 to 3 kg of straw per cow per day is required for bedding. Cemented floors are usually preferred, however, earthen floors could be considered for resting areas, provided they are 8 to 12 inches above the ground level and sloped away from the building to provide good drainage.

Benefits of loose housing system

The loose housing system involves low cost of construction and maintenance, provides more comfort to animals, ensures easier detection of oestrus and better labour efficiency, as compared to the conventional housing system. Fig. 2.7 mentions various benefits of loose housing system.



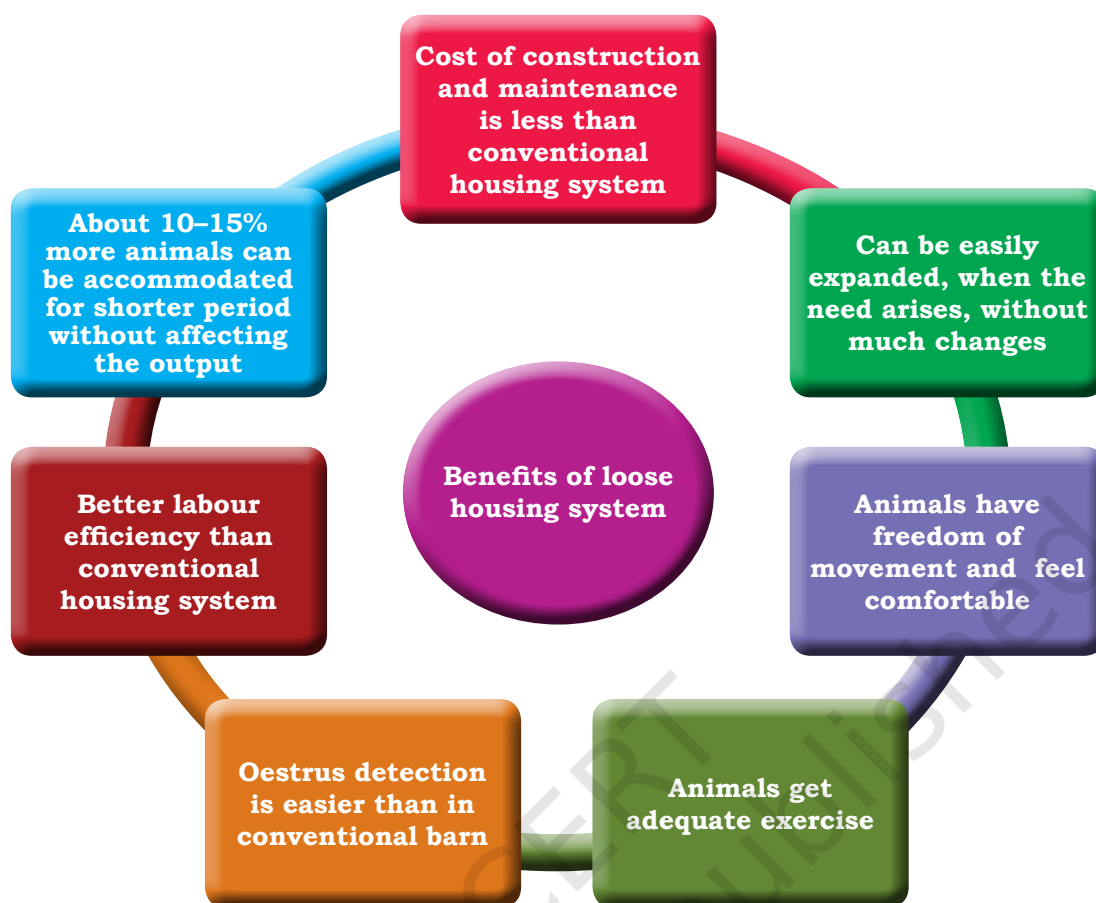


Fig. 2.7: Benefits of loose housing system

Conventional housing system

In this system, animals are tied in a stall for feeding, watering, milking and resting. They are confined together within the shed and tied by neck chains. The barns are completely roofed and the walls have windows and ventilators. The distance between two sheds is generally not less than 30 feet. The feed is delivered in a trough in front of the animals, and they are milked individually in the stall using buckets. The manure is collected in a gutter. This type of housing is most suited for temperate regions, as it protects the animals from heavy snowfall, rains and strong winds. The conventional barns provide better protection when winter is prolonged and severe. However, there are a few disadvantages of conventional housing system, for example, if the cattle are tied up all year round, their feet become stiff and could lead to feet problems. Also, oestrus in cattle is difficult to detect.



Cattle shed

The arrangement of the animals within a shed depends upon the number of animals to be accommodated. It is advised to have a single row system when the number of animals is up to 10. When the number of animals exceeds 10, the double row system is desirable. Generally, one shed can accommodate 50–60 cattle. However, modern management system allows one shed to accommodate even 100 cows. In double row housing, either the cattle face out from each other (tail-to-tail system) or face in towards each other (head-to-head system). Each animal is provided a separate manger.



Fig. 2.8: Tail-to-tail housing system

Tail-to-tail system of housing

In this system, the animals are tied in the shed in opposite direction (Fig. 2.8). The cleaning of sheds and milking of cows is easy and chances of disease transmission from animal to animal are also reduced. Under this system, problems in hind quarters of animals can be detected easily, as compared to loose system of housing. Animals get fresh air directly and the milking process can be effectively supervised (Fig. 2.9).

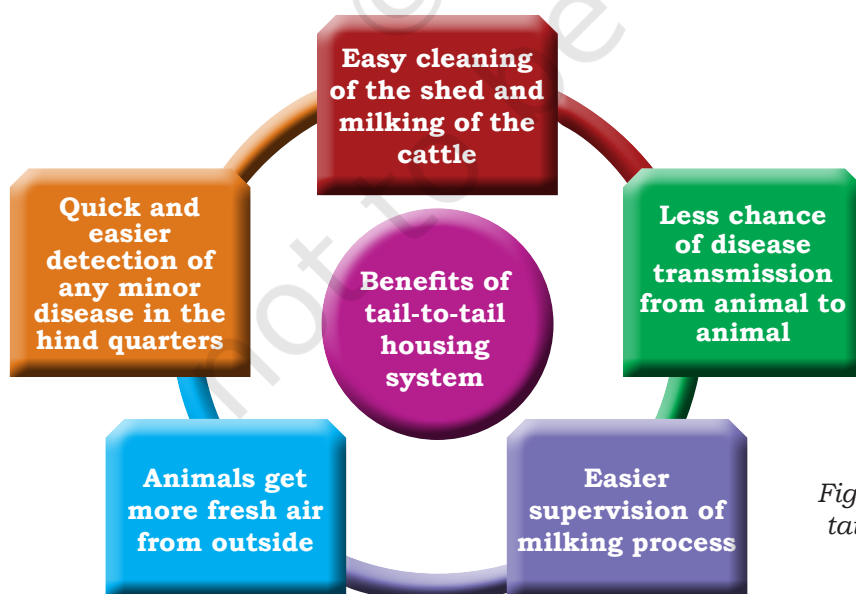


Fig. 2.9: Benefits of tail-to-tail housing system



Head-to-head system of housing

In this system, animals are tied in such a way that they stand facing each other. This makes it easy for the animals to go to their stalls, and feed with ease, thus enabling better management. The morning sunlight falls maximum on the gutter, which improves the overall hygiene of the shed (Fig. 2.10). The various benefits of head-to-head system are mentioned in Fig. 2.11.



Fig. 2.10: Head-to-head housing system

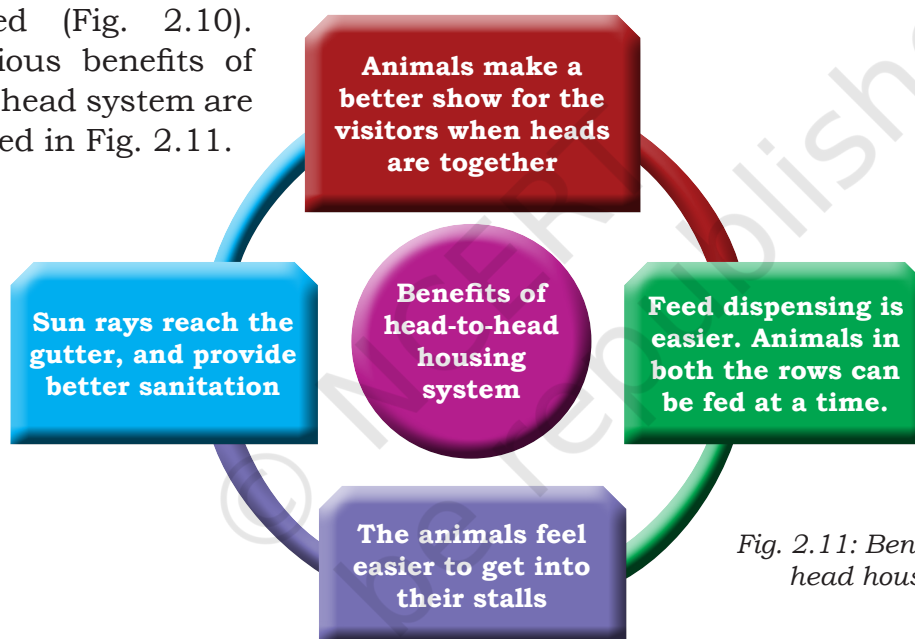


Fig. 2.11: Benefits of head-to-head housing system

Equipment and machinery required for livestock housing

The type and number of equipment and machinery required in a dairy farm depends on the level of mechanisation and the total number of animals. However, some of the essential machinery and tools are chaff cutters, milking utensils and other minor implements, which are required irrespective of the number of animals.

If the dairy farm is situated in an area with extreme weather conditions, cooling and heating devices are required, especially for young calves, ill, injured and

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pregnant animals. In case the number of milch animals exceeds 50, milk cooling devices, generator set and a utility vehicle are also essential for storage and selling of milk, etc. If you are interested in keeping a large number of animals, it is better to have some area designated for fodder cultivation. In this case, farm equipment like tractor, seed sowing, fodder harvesting and processing equipment are also required.

A list of equipment and machinery required for small and medium sized dairy farm is as follows (Table 2.3).

Table 2.3: Equipment and machinery used in small and medium sized dairy farms

Section	Equipment and machinery
Fodder production	Tractor
	Trolley
	Large weigh bridge
	Fodder-reaper-cum-binder
Feed processing	Chaff cutter (manual or motor-operated)
	Feed grinder
	Feed mixer
Dairy section	Cooling system
	Heating system
	Generator
	Tubewell with motor
	Milking machine
	Animal weigh bridge
	Electrical dehorner
	Burdizzo castrator
	Tagging set
	Branding numbers
	Drenching bottle
	Hoof trimmer
	Ropes, fire controlling equipment, iron chains, etc.

Fig. 2.12 (a-i) shows some common machinery and equipment used in a dairy farm.



Fig. 2.12 (a)

Platform type electronic animal weigh bridge: It is used to measure the body weight of animals.



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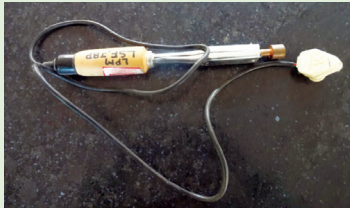


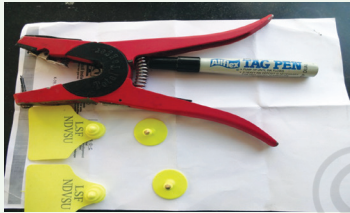


 <p><i>Fig. 2.12 (b)</i></p>	<p>Bull leader: It is used for controlling the bull.</p>
 <p><i>Fig. 2.12 (c)</i></p>	<p>Electrical dehorner: It is used for disbudding the horns in young calves.</p>
 <p><i>Fig. 2.12 (d)</i></p>	<p>Drenching bottle (Metal): It is used for application of medicine through oral route.</p>
 <p><i>Fig. 2.12 (e)</i></p>	<p>Bull nose ring: Nose rings are inserted through the nasal septum of bull, which help in controlling them.</p>
 <p><i>Fig. 2.12 (f)</i></p>	<p>Ear tags and tag applicator: These are used for fixing tags in the ears, for easy identification of animals.</p>
 <p><i>Fig. 2.12 (g)</i></p>	<p>Branding numbers: These numbers are stamped behind the right hip of the animal, for easier identification of the cattle.</p>
 <p><i>Fig. 2.12 (h)</i></p>	<p>Burdizzo castrator: As the name suggests, it is used for castrating male calves.</p>



Fig. 2.12 (i)

Hoof trimmer: It is used for trimming the hooves of cattle.

Fig. 2.12 (a-i): Common machinery and equipment used in dairy farms

Standard workplace procedures followed in a dairy farm

Dairying is a 365 days a year all-weather activity, and therefore, it is not feasible for a dairy entrepreneur to supervise all operations of the dairy farm round the clock. Critical tasks such as operating milking machines, oestrus detection and many other aspects of dairy farming cannot be easily measured and therefore have been mechanised.

Routine activities of a dairy farm

Various routine activities of a dairy farm are classified in three major groups, i.e., daily routine, monthly routine and quarterly or yearly routine (Fig. 2.13).

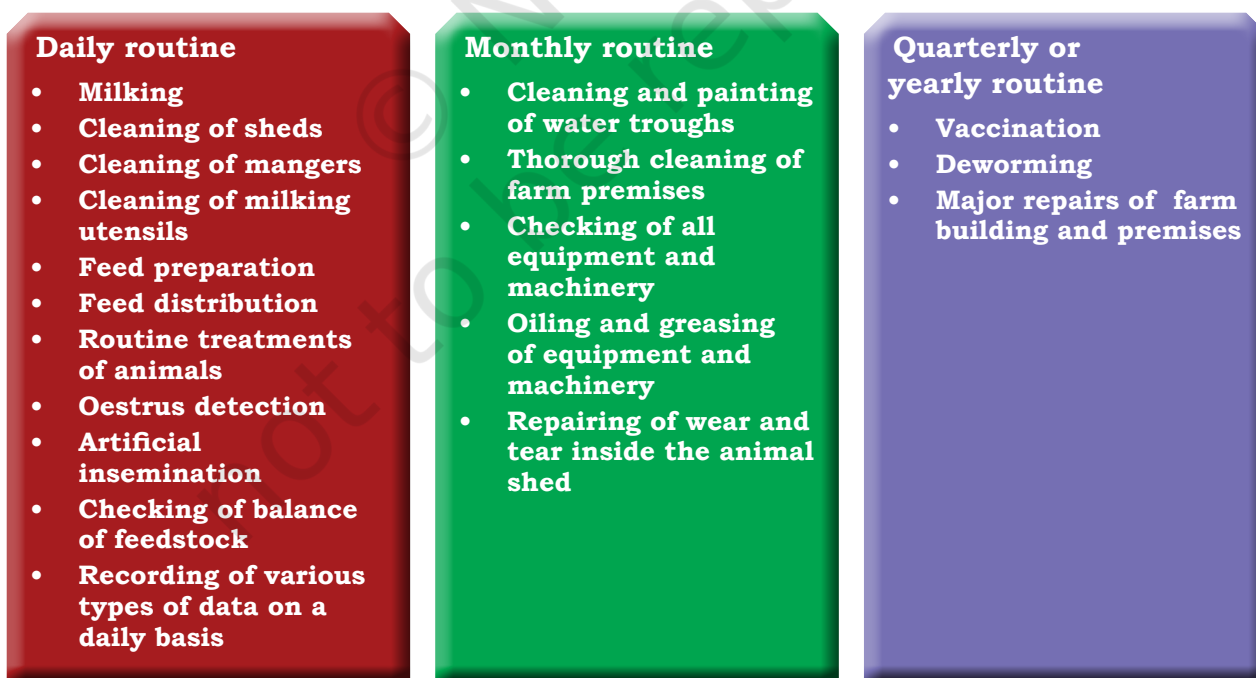


Fig. 2.13: Various routine activities of a dairy farm



Practical Exercise

Activity 1: Examine the housing design of a nearby dairy farm.

Material required

Measuring tape, Camera, Notebook

Procedure

1. Visit a nearby dairy farm.
2. Note down the various structures existing at the dairy farm, and examine them.
3. Draw a sketch-map of the dairy farm.

Check Your Progress

A. Multiple choice questions

1. The advantage of head-to-head system of livestock housing is _____.
(a) easier supervision of milking
(b) animals get more fresh air from outside
(c) feed dispensing is easier, both rows can be fed at a time
(d) None of the above
2. For adult buffaloes, floor space requirement (m^2) under covered area is _____.
(a) 3.5 (b) 4.0
(c) 7.0 (d) 8.0
3. Loose housing system is suitable for which of the following states?
(a) Punjab (b) Rajasthan
(c) Maharashtra (d) All of these
4. Which of the following housing system is suitable for temperate regions?
(a) Loose housing (b) Conventional housing
(c) Both (a) and (b) (d) None of these
5. Which of the following machinery is used in fodder production?
(a) Tractor (b) Reaper-cum-binder
(c) Cultivator (d) All of these

B. Fill in the blanks

1. A loose housing system has open area or paddock and _____ area.
2. In a loose house, the height of the fencing is not less than _____.
3. The single row system is advisable when the number of animals is up to _____.
4. In conventional barns, the distance between two sheds is not less than _____.
5. Burdizzo castrator is used for _____.

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C. Mark true or false

1. Improper arrangements in animal sheds may result in additional expenditure on labour.
2. In conventional housing system, each animal is provided with a separate manger in the barn.
3. Heat detection is easy to carry out in a conventional barn.
4. In the loose housing system, animals are kept loose in the shed.
5. In big farms, it is always economical to purchase fodder from the market.

D. Match the following

- | A | B |
|-----------------------|--------------------------------|
| 1. Drenching bottle | (a) Identification |
| 2. Burdizzo castrator | (b) Administration of medicine |
| 3. Dehorner | (c) Castration |
| 4. Bull nose ring | (d) Dehorning |
| 5. Branding numbers | (e) Controlling of bull |

E. Crossword

	² P			³ B	
¹ M			G		⁴
	D			D	O
					D
R	C				
E	K			G	

Across

1. The designated area for feeding animals.

Down

1. Mixture of cow dung, leftover feed and other organic matter in a dairy farm.
2. Open area for the animals
3. Used within the animal shed which provides comfort to the animals.
4. Structure essential to move things from one place to another within a farm.

SESSION 2: HOUSING LAYOUT FOR DAIRY ANIMALS

Housing for animals is designed in such a way that it can accommodate animals of all age groups separately. At the same time, the animal house facilitates various farm activities such as milking, feeding and cleaning in a safe

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and efficient manner. The animal house also provides comfort to the animals for optimal milk production and protection against unfavourable weather conditions (for example, heat, rain and wind). The animal house is constructed based on certain principles which are mentioned in Fig. 2.14.

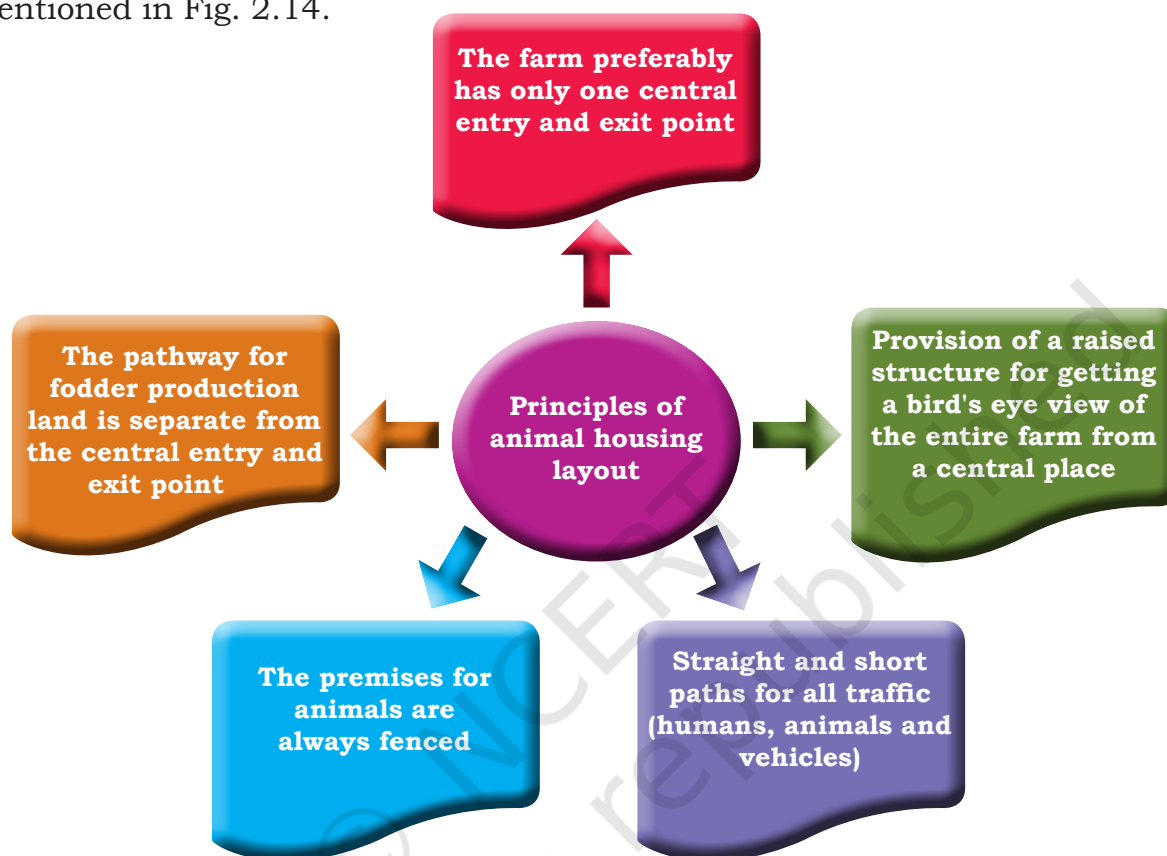


Fig. 2.14: Principles of animal housing layout

Grouping of cattle in a herd

A dairy farmer divides the dairy herd into different groups, especially when the size of the dairy farm is large. The grouping of the animals is based on the nutritional as well as operational requirements. Animals can be categorised as heifers, lactating cows (early, mid and late), dry cows, advanced pregnant cows, sick animals, breeding bulls, suckling calves and young calves. Appropriate grouping of animals reduces labour requirement, chances of fighting among the animals and helps in their better management. The various terms used for different categories of cows and buffaloes are described in Table 2.4.



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Table 2.4: Various terms for different categories of cows and buffaloes

Category of animal	Cow	Buffalo
Adult male	Bull	Buffalo bull
Adult female	Cow	She buffalo
Newborn (up to one year)	Calf	Buffalo calf
Male (above one year and up to sexual maturity)	Yearling/ young male	Yearling buffalo/ buffalo young male
Female (above one year and up to first calving)	Heifer	Buffalo heifer
Castrated male	Bullock	Buffalo bullock
Act of parturition	Calving	Calving
Act of mating	Servicing	Servicing
Group of animals	Herd	Herd

Layout of animal housing

A large dairy farm has three essential sections—cattle section, dairy section and fodder production section. The various structures associated with these sections are given in Table 2.5.

Table 2.5: Important sections of a dairy farm

Cattle section	Animal shed	Milking animal shed
		Dry animal shed
		Calving box or calving pen
		Heifer shed
		Calf shed
		Bull shed
		Milking parlour
		Sick animal shed
	Ancillary structure	Artificial insemination-cum-veterinary dispensary
		Concentrate godown
		Dry fodder godown
		Chaffing shed
		Handling yard
		Manure disposal area
		Silo
		Trevis
		Wallowing tank



Dairy section		Milk collection room
		Milking utensils storage room
Fodder production section		Implements and workshop shed
		Fertiliser and fodder seed storage room

Layout plan of a large dairy farm

The layout plan of a large dairy farm as per the Bureau of Indian Standards is given in Fig. 2.15.

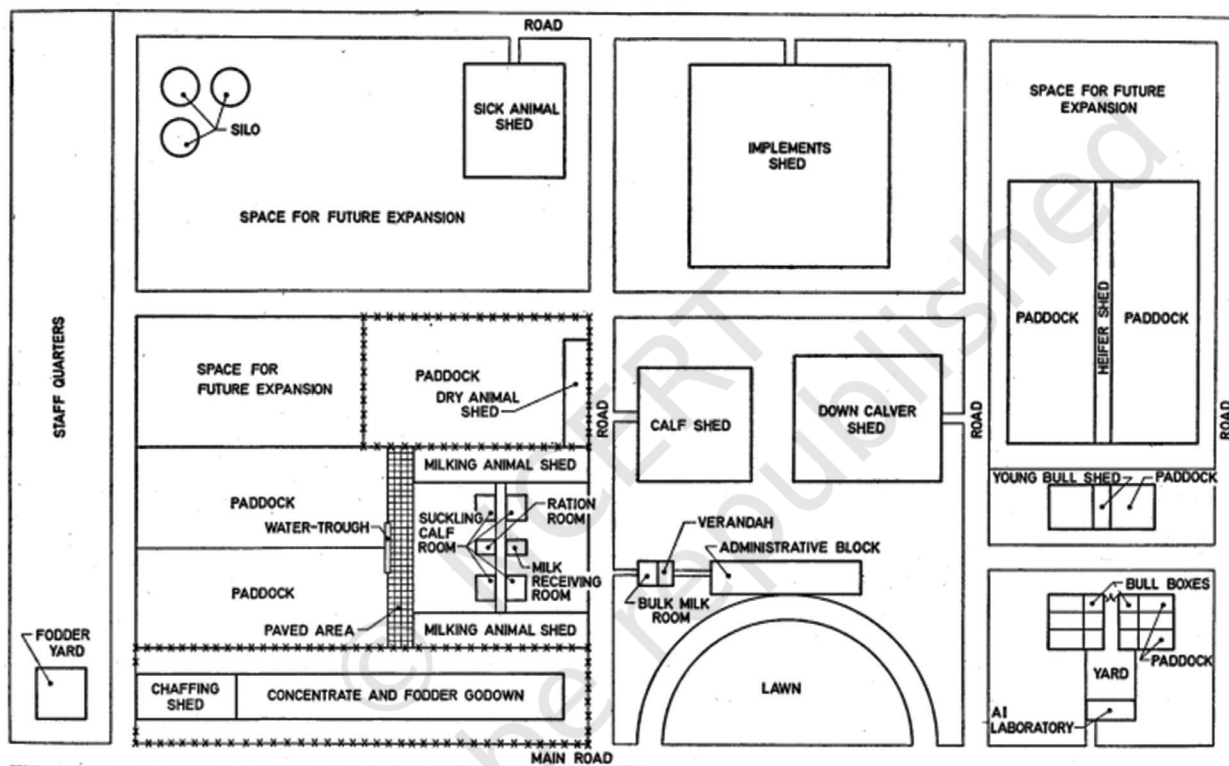


Fig. 2.15: Layout plan of a large dairy farm (Bureau of Indian Standards)

Cattle section

This is the most important section in a dairy farm. It has various units which are planned in such a way that they provide comfort and protection to the animals and operational convenience to the farm workers.

Animal shed

Milch animal shed

The length and width of the floor area of the milch animal shed is calculated on the basis of the average size of

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animals. The per animal floor space requirement may vary from 1.5 to 1.7 metres in length and 1 to 1.2 metres in width. The width of the central passage may be 1.8 metres. The central passage has a slope in such a way that the central axis is 25 mm height and it gradually reduces to 1 mm towards both the sides. There are two drains laid on either side of the central passage in tail-to-tail system. There are two continuous mangers on the outer side of the area. The floor has the slope ratio of 1 in 40 towards the drainage.

Milking parlour

The cattle are milked in the milking parlour which is a separate structure in the dairy farm. The milking parlour is a must when the animals are maintained in loose housing system. Animals are brought to the milking parlour for milking and after that, they are taken back to the feeding or resting area. The milking parlour is usually a part of a larger complex known as the milking centre, which houses supporting structures and equipment for the parlour. A milking centre consists of the following.

Holding area: A paved area is provided just outside the milking parlour entrance to hold the cattle till they are to be milked. It may be open or covered area. The space requirement for the holding area is about 15 square feet per animal. The slope of the holding area is opposite to the entrance of the milking parlour.

Milk room: The room is used for storing milk and equipment meant for cooling, cleaning and sanitising the milk.

Utility room: In this room, equipment such as vacuum pumps, refrigeration compressors and water heaters are kept.

The dimensions of various units of milking parlour are given in Table 2.6.

Double rows of standing can be arranged either in tail-to-tail or head-to-head system. For the purpose of milking, the tail-to-tail arrangement is comparatively better than the head-to-head system. The milking parlour can be used for milking in two-three shifts depending upon the system of milking (hand milking or machine milking).





Fig. 2.16: Fully automatic milking parlour at NDRI-Karnal

Therefore, the size of the milking parlour is such that it can accommodate half to one-third of the total number of milking animals at a time.

Table 2.6: Dimensions of milking parlour

Length of standing space	1.5 –1.7 metres
Width of standing space	1.05–1.2 metres
Width of central passage	1.5–1.8 metres
Width of feed alley	0.75 metre
Width of gutter	0.30 metre
Width of manger	1.40 metres

Dry animal shed

The shed for dry animals may be of loose housing type and consist of a centrally placed manger under a roof in the paddock. The manger is surrounded by a 2.2 metre-wide paved platform with drainage.

Calving pens

Although cattle prefer to live in herds, however, at the time of giving birth, they like a quiet place away from the disturbance

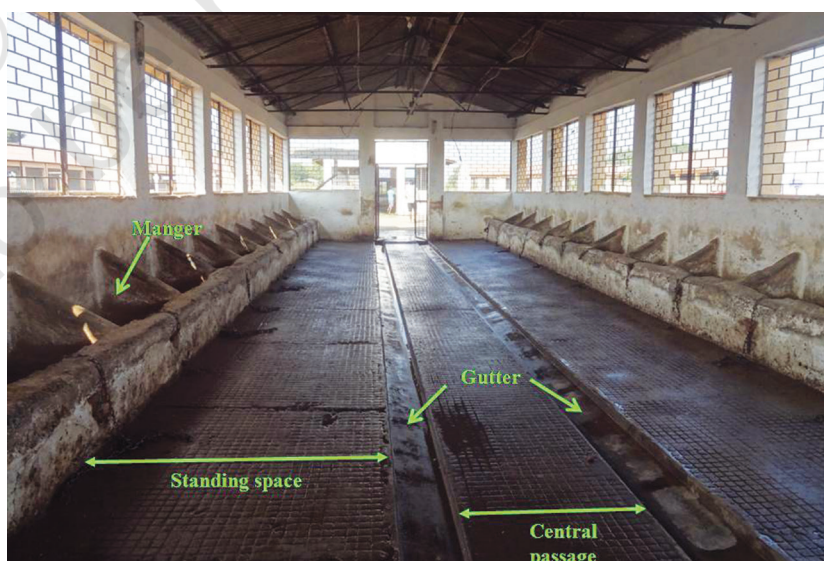


Fig. 2.17: A cleaned milking parlour suitable for hand milking



Fig. 2.18: Closed area of calving pen



Fig. 2.19: Open area of calving pen

of the herd and farm workers. After calving, the animal needs to be with her calf to establish a bond with the newly born calf. In a conventional housing system, cattle generally remain in the same barn while giving birth. However, in a loose housing system, the cattle is isolated from the herd and placed in an individual calving pen. The calving pen is sufficiently spacious, well lit, draught-free and easy to reach and clean. Two to three weeks before the expected date of calving, the animals are shifted to a calving pen. Such animals remain in the calving pen up to 3 to 5 days after calving.

There is one calving pen for every 20 animals, i.e., 5 per cent of the breedable animals. In advanced pregnancy, animals are housed in loose boxes enclosed from all sides with a door. Such accommodation has an area of about 12 square metres with ample soft bedding. Sand can also be used as bedding material with a minimum height of 30 centimetres. The floor of the calving pen is made non-slippery and each pen is connected to an independent drain. The closed and open area of calving pen is shown in Figs. 2.18 and 2.19.

Calf shed

Newborn calves are individually housed during the first few weeks. Since a calf is quite susceptible to all kinds of infections, the death rate is highest in the initial weeks. Therefore special attention is paid to hygiene and climatic conditions. The calves are housed in individual pens up to the age of eight weeks and then they are placed in group housing system.

Individual housing for calves: Calves are housed separately because they have a natural tendency of suckling, in the absence of such stimulus they have a tendency of cross-suckling (suck one another), which can cause easy transmission of diseases in them. Individual



pens for calves help in feeding them individually, for easy observation and keeping a check on diseases. The pens are constructed in such a manner that the calves can see and hear the other calves. Thus, a single pen has open or partly open sides. The height of the partition of the pens is about 75 cm. Feeding box is attached to the gate which facilitates feeding of calf starter to them (Fig. 2.21).

Group housing for calves: After rearing the calves in individual pens for about two months, they are housed in groups of 3–5 calves per pen, preferably on straw bedding. Calves are never accommodated with adults in the cattle shed. The calf house has provisions for daylight, proper ventilation and good drainage, as damp and wet floors can make calves susceptible to respiratory problems.

For better management of calves, they are classified into three groups— (a) below one month of age, (b) below the age of 3 months, and (c) 3 to 6 months old and those over 6 months. The floor space requirement per calf is about 20–25 square feet for calves below 3 months and 30 square feet for those in the 3–6 months age group. The whole area of the calf shed including paddock is well protected from birds as they can create wounds by pecking the calves.

Housing for heifers and young males

A heifer is a young female cattle over one year of age until first calving. A young male cattle over one year of age until sexual maturity is known as young male. As a standard practice, the heifers are housed separately from young males, otherwise undesirable mating may occur.



Fig. 2.20: Calves showing cross-sucking behaviour



Fig. 2.21: Individual calf pens (feeding box fitted on the door)



Fig. 2.22: Growing calves (approx. 4–6 months of age) housed in a group

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Bull shed

Breeding bulls are always maintained in individual pens, to allow them sufficient open space for free movement. If bulls are not adequately exercised, it leads to overgrowth of the hoofs creating difficulty in mounting the breedable cows. This also causes a loss in the breeding efficiency of the bull. The shed for bulls has mangers and a water trough. From its shed, the bull can see other animals of the herd so that it does not feel isolated. The bull shed is provided with a strong fence or a boundary wall of about 4 feet height.

Ancillary structures

The secondary structures which are useful for day-to-day farm operations are called ancillary structures, and these are useful for both loose and conventional systems of animal housing. The size and number of different ancillary structures depends on the herd size. The various ancillary structures are described below.

Artificial insemination (AI) laboratory

Adjacent to a bull shed, there is a 10 x 10 metre service yard with a service crate for the collection of semen. The AI laboratory is attached to the service yard where testing, processing and storage of semen is carried out. The minimum dimensions for laboratory are 3 x 4 metres. An area of 3 x 4 metre each is required for wash-up room and room for supervising staff.

Trevis

Trevis is used for purposes of both treatment and artificial insemination of cattle. It is a U-shaped structure made of 2 inches diameter galvanised steel pipes supported by five or seven pillars. One horizontal pipe is welded on the sides across the two rear pillars to protect the working technician from sidekicks by the animal. One adjustable pipe is put across the last two pillars through the clamps fixed on both sides of these pillars to prevent the animals from going back out of the trevis. One iron ring for tying the animal is provided at the top of front pillar to prevent the animal from jumping off. Two different types of trevis are shown in Figs. 2.23 and 2.24.





Fig. 2.23: Trevis



Fig. 2.24: Cow inside the trevis for examination

Casting pit

It is the area where animals are forced to lie down for treatment or other purposes. In large farms, it is desirable and economical to construct one casting pit that can be used for vaccination and treatment of animals. The dimension of the casting pit is usually 0.31 m deep and 2.4 m high along with a diameter of 7.62 m. The casting pit contains about 15 cm of sand or saw dust or a mixture of both, which acts as a comfortable bedding material for the animals (Fig. 2.25).



Fig. 2.25: Casting pit

Sick animals' shed and veterinary dispensary

The shed for sick animals is located away from the healthy animal sheds. Each sick animal is accommodated in a single pen within the sick animal shed. The dimensions and arrangements of sick animal pens are same as for calving pens. The paddock of the sick animals is paved and regularly washed. A trevis is placed at one of the corners of the paddock. For the treatment of sick animals, a room of 3 x 4 metres is provided with a dispensing counter, shelves and two or three cupboards. It is also provided with a porcelain sink and a power plug for sterilization of material. The pharmacy has built-in shelves and cupboards and a working table. A diagnostic laboratory of 3 x 4 metres is provided adjacent to the pharmacy room.

Isolation yard

Animals suffering from infectious diseases are segregated from the rest of the herd. The number of



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isolation yards depends upon the size of the herd, and for every 40 animals one isolation yard is provided. One isolation yard can accommodate two to six animals depending upon the size of the animals. It has independent drainage which is connected to the main drainage running behind the shed, so that no animal comes in contact with potentially infected discharges, etc. The yard is suitably fenced, and provided with a manger and a water trough. A fly-proof wire netting door is provided in the yard, to avoid insects. The dimension of an isolation yard is about 5×3 metres and has a stanchion or tie-stall in one corner.

Post-mortem platform

The post-mortem platform is a raised structure of 3×4 metres with a roof. It is used for performing post-mortem examination of dead animals, and is kept at a considerable distance from the animal shed. An incinerator is provided to completely burn-off the carcass of animals suffering from contagious diseases.

Stores for concentrates and dry fodder

Another important ancillary structure of animal houses are concentrate and dry fodder stores. For uninterrupted feeding of animals, sufficient quantity of feed and fodder is kept ready in the stores. The size and type of buildings for these stores depends on the quantity of feed and fodder required to be stored on the farm. It is advisable to store sufficient amount of concentrates required for at least three months. The usual space requirement for concentrate godown is 0.2 cubic metre per animal. The concentrate store-cum-feed mixing room and the ration room are located near the milking parlour. In smaller farms, one feed store near the milking parlour could be sufficient. The structure of the feed room is made in such a way that it is damp-proof and rodent-proof.

Dry fodder such as hay or crop by-products like straws are fed to the animals on a daily basis, and therefore, facilities for their proper storage are essential. Straws are available during the harvesting season at cheaper rates, and it would be economical to store the whole quantity of straws required for the year in one go, during



the harvesting season itself. Adult animals consume about 6 kg of dry fodder per day while young animals consume about 3 kg per day, besides green fodder and concentrates. Thus, the size of the shed needed to store dry fodder can be calculated accordingly.

The size of the hay godown must meet the requirements of hay for at least two months. The annual quantity of hay required can be calculated on the basis of the number of days in a year when hay is necessary.

Ration room

In a medium-sized farm, a room of at least 3 x 4 metres is provided near the milking shed, which stores concentrates to meet the daily requirements of animals. It is important to ensure that the ration room is damp-proof and rodent-proof.

Chaffing shed

The chaffing shed is used for cutting the grasses and green fodder into very small pieces with the help of the chaffing machine, to improve the overall palatability and digestibility of the green fodder. The floor of the chaffing shed is sufficiently hard and preferably constructed in cement concrete. The floor area is at least 14 x 4 metres. A chaffing shed consists of two portions, one for storing the fodder to be chaffed, and the other portion for storing the chaffed material. The location of the chaffing shed is such that it facilitates the chaffing and removal of the chaffed fodder.



Fig. 2.26: Chaffing shed

Silos

The nutritive value of fresh green fodder is the highest and the nutritive value of the fodder decreases when it is dried. Therefore, through the process of silage, the nutritive profile of the green fodder is maintained. Silage is a method to preserve the green fodder for cows

and buffaloes for consumption at a time when green fodder is not available in required quantity. The grasses and green fodder are cut and then fermented to retain as much sugars and proteins present in them. Many microscopic organisms living in the grasses and green fodder carry out the process of fermentation to convert the green fodder and grasses into silage.

Silos are the structures meant for storing the silage. The types of silos could be tower-type, pit-type or trench-type. In India, trench-type of silos are more practicable and convenient. The silos are preferably constructed near the animal shed. They are constructed on elevated ground to provide sufficient amount of silage during the months of May to June and October to November, when there is shortage of green fodder. A silage of a good quality weighs 0.40 to 0.48 tonnes/m³. The average daily requirement of silage for adult cow and buffalo is 10–13 kg.

Wallowing tank for buffaloes

Wallowing means rolling or lying in mud or water to cool the body. It is a natural instinct of buffaloes to wallow in pond and muddy pools. Wallowing is often noticed in summer season. During high environmental temperature and humidity, buffaloes may wallow at a stretch up to 5 hours in which they completely immerse themselves into the water except nostrils and chew with half-closed eyes. Buffaloes experience summer stress as they have dark skin, sparse hair, less number of sweat glands which have less sweating ability and are deeply sited into the skin. Besides

cooling, wallowing also helps in removing ecto-parasites and other pests. It is therefore vital to have a wallowing tank (Fig. 2.27) in a buffalo farm as a mechanism for dissipation of their body heat. An average wallowing tank (40 × 60 ft) can accommodate about 100 adult buffaloes at a time. The water of the wallowing tank is changed every week.



Fig. 2.27: Wallowing tank for buffaloes



Dairy section

The primary function of the dairy farm is to produce milk. Therefore, suitable arrangement is made for hygienic handling, processing and disposal of milk. The dairy section has the following components.

Milk receiving room

Collection of milk is an important activity in the day-to-day dairy farm operations. In the milk receiving room, the milk is collected after milking, weighed and stored in cans for small periods before being transported to the bulk milk room and ultimately reaches milk plants or market. The doors and windows of the milk receiving room are made fly-proof to ensure hygiene. The flooring of the room is made impervious and wear-resistant. The dimensions of a milk receiving room depend upon the quantity of milk handled daily.



Fig. 2.28: Fly-proof milk receiving room

In a large farm, the recording-cum-milk cooling room, the room for milk utensils and equipment, and washing room are constructed separately.

Bulk milk room and ancillary structures

In a large dairy farm, there is a separate bulk milk room, the floor area of which is at least 4 x 5 m. The area of a bulk milk room depends upon the amount of milk produced per day. After the milk is collected in the milk receiving room, it is transferred in cans to the bulk milk room. The milk cans are placed here in insulated tanks filled with refrigerated water. To inhibit bacterial growth and prevent spoilage of milk, the temperature of milk is kept around 4–5°C. An office room, compressor room and utensil wash-up room are located adjacent to the bulk milk room.

Fodder production section

Continuous supply of green fodder to the ruminants like cows and buffaloes is a prerequisite for the health



and economy of the farm. The structural requirements for fodder production section are as follows.



Fig. 2.29: Entry of an implements shed

Implements and workshop shed

Implements shed is constructed to accommodate tractors and other implements used for various farm activities. The width of the shed is preferably 8 metres. The eaves project out about a metre. There is a 10 metre wide open space on three sides and 13 metres on the front side of the shed for easy turning and movement of vehicles as shown in Fig. 2.29.

Manure disposal area

Animals defecate approximately 8 per cent of their body weight in a day. Large quantities of urine, leftover feed and fodder, bedding material, etc., are simultaneously produced in a livestock farm. Animal excreta is often mixed with straw and can be used as fertiliser for soils. Proper storage of manure is an important part of manure management. The manure from cattle shed is removed at least twice a day. It can be disposed of either in solid or in liquid form (slurry).

Solid manure disposal

Manure is treated as solid when the dry matter content exceeds 25 per cent, and which can be temporarily stockpiled. The height of the stack can be 1.5 to 2 metres. Stockpiled manure is kept on a concrete pad or plastic sheet at least 100 feet from wells and other water sources. Hard floors prevent moisture present in the manure to seep into the soil, and thus, avoids contamination of groundwater.

The manure is loaded in a trolley or cart and hauled away to the compost pits or vermicomposting unit. The dimensions of the compost pit may be 4 x 2 x 1 metres or 5 x 2.5 x 1 metres. The number of compost pits depends on the number of animals. In a vermicomposting unit, earthworms are used to convert the solid manure into vermicompost. The average manure output observed in different farm animals is given in Table 2.7.



Table 2.7: Daily manure output in farm animals

	Manure output (kg)	Dry matter content (%)
Cow	30–35	18–20
Buffalo	35–40	16–18
Sheep and Goat	1.0–2.5	38–40

Manure pit

It is constructed sufficiently away from the animal houses to avoid bad smell and infestation of flies and other insects. However, it need not be constructed very far which could require more labour for transporting manure. The manure pit is cleared every 6 to 8 weeks.

Liquid manure disposal

The mixture of dung and urine is known as slurry. A manure with less than 20 per cent solids has the consistency of thick slurry, which can be directly disposed into the fields.

Schedule of daily farm operations

Animals prefer to follow a certain routine, any deviation in which can cause stress in the animals. Certain operations like cleaning, feeding, milking, etc., are time-consuming and need to be finished in time, therefore proper scheduling of dairy farm operations is essential. The cleaning of animal shed and paddock requires major inputs of labour. Cleaning of cattle before milking is another important daily activity. Fig. 2.30 shows a cow with an unclean back and Fig. 2.31 shows a perfectly clean cow.



Fig. 2.30: Unclean cow



Fig. 2.31: A perfectly clean cow

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The dairy farmer follows a schedule of operations for efficient farm management. The schedule of daily farm operations at College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur is given in Table 2.8. The farmer can devise his/her own schedule of dairy farm operations on the basis of this schedule.

Table 2.8: Schedule of daily farm operations at College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur, Madhya Pradesh

Approximate time (hours)	Farm operations	Material required
04:00–04:30	<ul style="list-style-type: none"> Cleaning/brushing of milch animals 	<ul style="list-style-type: none"> Hose pipe Water supply Grooming brush
04:30–06:30	<ul style="list-style-type: none"> At the time of milking, animals are offered half of the daily concentrate required for milk production Milking of animals 	<ul style="list-style-type: none"> Concentrate mixture Measuring appliances Towel Milking bucket Post milking teat dips
06:00–06:30	<ul style="list-style-type: none"> Delivery of raw milk (in cans) to the milk vendors 	<ul style="list-style-type: none"> Milk storage container
	<ul style="list-style-type: none"> Washing and disinfection of milking barns 	<ul style="list-style-type: none"> Hose pipe Water supply Disinfectants
06:30–08:00	<ul style="list-style-type: none"> Cleaning of animal shed and paddock 	<ul style="list-style-type: none"> Hose pipe Water supply
	<ul style="list-style-type: none"> Cleaning farm premises 	<ul style="list-style-type: none"> Hose pipe Water supply Broom
	<ul style="list-style-type: none"> Isolation of sick animals 	<ul style="list-style-type: none"> Rope
	<ul style="list-style-type: none"> Isolation of cows 'in-heat' for artificial insemination 	<ul style="list-style-type: none"> Rope
08:00–11:00	<ul style="list-style-type: none"> Cleaning of calf pen, calving box, dry stock and bull shed 	<ul style="list-style-type: none"> Broom Disinfectants
	<ul style="list-style-type: none"> Feeding of dry/green fodder 	<ul style="list-style-type: none"> Dry/ green fodder Feed distribution trolley or tractor



	<ul style="list-style-type: none"> • Feeding half of the daily concentrate mixture to calves, heifers, pregnant cows and bulls • Treating sick animals • Breeding cows which are 'in-heat' • Harvesting, chaffing and feeding of green fodder to all the stock 	<ul style="list-style-type: none"> • Concentrate mixture • Feed distribution trolley • Isolation shed • Medicines • Material required for artificial insemination • Chaff cutter • Feed distribution trolley or tractor
11:00–14:00	<ul style="list-style-type: none"> • Lunch-cum-rest period for labourers 	
14:00–17:00	<ul style="list-style-type: none"> • Miscellaneous jobs of dairy farm like animal identification, preparation of concentrate mixture, repair of farm fences, fittings and repair of equipment, rope and halter making, weekly scrubbing and whitewashing of water trough, manure disposal, periodical deworming of different categories of animals, weighing of animals, clipping hair as per requirement, grooming, hoof trimming, etc. 	
14:30–15:30	<ul style="list-style-type: none"> • Washing/brushing of milch animals by milkers 	<ul style="list-style-type: none"> • Hose pipe • Water supply
15:30–17:30	<ul style="list-style-type: none"> • At the time of afternoon milking, animals are offered half of the daily concentrate required for milk production • Milking of animals 	<ul style="list-style-type: none"> • Concentrate mixture • Measuring appliances • Towel • Milking bucket • Post milking teat dips

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	<ul style="list-style-type: none"> • Cleaning calf pen, calving box, dry stock and bull sheds • Feeding rest other half of concentrate ration to calves, heifers, pregnant cows and bulls • Feeding of dry/green fodder to milch stock 	<ul style="list-style-type: none"> • Hose pipe • Water supply • Broom • Concentrate • Feed distribution trolley • Dry/green fodder • Feed distribution trolley or tractor
16:30–17:30	<ul style="list-style-type: none"> • Delivery of milk (in cans) to milk vendors • Washing and disinfections of milking barns • Feeding dry and green fodder to calves, heifers, dry stock and bulls 	<ul style="list-style-type: none"> • Milk storage container • Hose pipe • Water supply • Dry/green fodder • Feed distribution trolley or tractor
16:00–17:30	<ul style="list-style-type: none"> • Cleaning of milch cattle shed • Feeding green/dry fodder to milch cattle • Cleaning farm premises 	<ul style="list-style-type: none"> • Hose pipe • Water supply • Dry/green fodder • Feed distribution trolley or tractor • Hose pipe • Water supply • Broom
18:30–04:00	<ul style="list-style-type: none"> • Night watchman on duty 	

Notes

1. For all the above operations, one milkman is engaged for every 12–14 cattle. The general farm labourers begin their duty at 7:00 am and remain till 11:30 am. The milkers begin their duty at 3:30 am and go off duty by 7:30 am.



Fig. 2.32: An unclean paddock requiring cleanliness

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Fig. 2.33: Dairy workers cleaning the paddock area with specially designed spade (phawda)

2. Animals are taken for grazing (if practiced) between 9 am and 2 pm in winter and between 6 am and 10 am and again between 5 pm and 7 pm in summer.
3. The manager plans the jobs well in advance in such a way that work is evenly distributed over the week. Some jobs may require longer time and the labourers are required to work extra time on such occasions.
4. The milkers come on duty by 2:30 pm and remain till 6:30 pm, whereas general farm labour start their duty by 2:00 pm and remain till 5:30 pm.

Practical Exercises

Activity 1: Note down the dimensions of various housing structures present in a nearby dairy farm.

Material required

Tape, Notebook

Procedure

1. Visit a dairy farm.
2. Measure the detailed dimensions of various sheds and allied structures present in the dairy farm and note them down in your notebook.

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Activity 2: Note down the daily schedule of a nearby dairy farm.

Material required

Notebook

Procedure

1. Visit a dairy farm early in the morning.
2. Note down each and every activity of the farm as per their time schedule.
3. Note down the routine and periodical activities of the farm.

Check Your Progress

A. Multiple choice questions

1. Which of the following animals prefers to wallow in water?
(a) Indigenous cattle (b) Crossbred cattle
(c) Buffalo (d) Exotic cattle
2. In a milch animals' shed, the width of the central passage is _____.
(a) 1.2 m (b) 1.8 m
(c) 2.2 m (d) 2.5m
3. Holding area is related to _____.
(a) calving box (b) calf pen
(c) milking parlour (d) bull pen
4. Advanced pregnant animals are transferred to a calving pen _____ before the expected date of calving.
(a) two to three weeks (b) one month
(c) one and a half month (d) two months
5. To maintain proper biosecurity, it is essential to maintain one isolation box per _____ cattle.
(a) 100 (b) 150
(c) 200 (d) 40

B. Fill in the blanks

1. Mixture of dung and urine is known as _____.
2. Animals defecate approximately _____ per cent of their body weight in a day.
3. To inhibit bacterial growth and to prevent spoilage of milk, the temperature of storage of milk is kept below _____ °C.
4. The number of calf pen in a farm is _____ per cent of the total breedable female cattle.
5. In the milch animal shed, the floor has the slope ratio of 1 in _____ towards the drainage.



C. Mark true or false

1. A good animal farm has many entry and exit points.
2. Milking parlour is a must in the loose housing system.
3. Damp and ill-drained floors do not cause respiratory problems in calves.
4. Bulls are kept in confinement, particularly on hard floors.
5. Calves in their initial days are housed in a group.

D. Match the following

- | A | B |
|--------------------|---|
| 1. Calving pen | (a) For keeping calf |
| 2. Calf pen | (b) Controlling of animals |
| 3. Trevis | (c) For keeping sick animals |
| 4. Isolation shed | (d) For the newly introduced animals in the farm |
| 5. Quarantine shed | (e) For keeping advance pregnant animal until calving |

E. Crossword

		¹ B			² P	
³	A		V			G
⁴ S			O			
	⁵ H		S			
		K				

Across

3. Act of parturition in cattle
4. A place where green fodder is stored under anaerobic conditions
5. Type of pipe used for washing of dairy animal shed.

Down

1. Castrated adult male of cattle
2. Confined area within a shed for keeping animals

GLOSSARY

Calving pen: An isolated and closed structure meant for giving birth by a cow or buffalo.

Chaff: The end product of chaffing, which is very palatable and used as cattle feed.

Chaffing: The process of cutting hay or straw or green fodder into very short pieces using a chaff cutter.



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Concentrate: Highly concentrated sources of nutrients to supplement the fodder and forages and include granular feeds such as cereals and legumes and some by-products of agro industries.

Down calver: A cow or heifer which is about to give birth to a calf.

Draught-free area: An area which is well-ventilated but does not allow strong and sudden drafts of air to enter.

Eaves: The part of a roof of animal housing/shed that overhangs the walls of a housing/shed.

Feedlot: An area where animals are offered feed and fodder in intensive type of dairy farming.

Hay: Dried and cut grasses used as fodder.

Heifer: Cows and buffaloes which have not yet given birth to a calf, or have given birth only once.

Herd: A group of cattle that live together.

Incinerator: The apparatus for burning the animal carcass at high temperatures until it is reduced to ash.

Manger: A structure used to provide feed to the animals.

Milking: The act of drawing milk from cows, goats or sheep for human consumption.

Milking machine: A special type of machine used to take milk from cows and buffaloes.

Milking parlour: An isolated building where cows and buffaloes kept in a loose system of housing are taken for milking.

Paddock: A fenced open area in a dairy farm used for pasturing or exercising animals.

Parturition: The birth of a new calf.

Pen: A small area with a fence round it in which livestock are kept.

Oestrus: It is the period when the female cows or buffaloes accept their male counterparts and mate. Such females are also called as being in heat.

Silo: A large structure, typically cylindrical, in which fodder or forage is stored for future use.

Slope ratio: The slope of a surface is generally calculated as a ratio, for example, a slope ratio of 1 to 100 cm means that the height of the surface decreases at the outermost end to 1 cm from the central height of 100 cm.

Stanchion: An iron chain loosely fitted around the neck of an animal to control its forward and backward movement within the shed.

Vermicompost: The final product of breakdown of manure and other bio-degradable matter by earthworms.

Water trough: A long, narrow, usually box-like shape, used to hold water for livestock.

